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Application No. 10/786,409
Filed: February 25, 2004
TC Art Unit: 1733
Confirmation No.: 3997

REMARKS

Claims 1, 7, and 11 have been amended, and claim 10 has been cancelled without prejudice or disclaimer. Claims 1-9 and 11-16 are pending.

The claims stand rejected for alleged obviousness and indefiniteness. Reconsideration of the rejections is requested in light of the amendments and the arguments presented below.

Rejections Under 35 U.S.C. §103(a)

Claims 1, 2, 4-6, and 8-16 stand rejected as allegedly obvious over Damon et al. GB 2,323,056 in view of Jarmon et al. The rejection is respectfully traversed.

Damon et al. GB 2,323,056 discloses a process in which pins are implanted in a panel formed of fiber plies impregnated with a resin in an uncured or not fully cured state. The panel is thereafter shaped to a desired form (page 5, lines 1-3) and curing of the resin is completed (page 5, lines 14-16) before removal of the pins. In order for the pins to be driven into the panel and for the preimpregnated panel to be shaped, it is required that the resin be not fully cured.

Regarding the use of a resin by Damon et al. GB 2,323,056 and its failure to teach or suggest densification with a solid

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matrix, such as a carbon or ceramic matrix, the Office Action states at page 4, line 4:

While it is recognized that U.K. '056 is not directed to a matrix material which is ceramic, the formation and use of a ceramic matrix was well known in the art and the problem of formation of perforations in a composite material (breaking and exposure of the fibrous reinforcement of the composite material) was the same regardless of the matrix material utilized.

As a first point, the sweeping assertions of what is "well known" are wholly unsupported and thus not available for use as a rejection. Thus the Office Action suggests that the substitution of the resin of Damon et al. GB 2,323,056 with the densified solid matrix of the present claims was obvious over Damon et al. GB 2,323,056 in view of the general knowledge of ceramic matrices. The Office Action further appears to suggest that the motivation for making this substitution was "the problem of formation of perforations in a composite material".

Damon et al. GB 2,323,056 fails to teach or suggest any step of partial densification by a solid matrix, as required by the present claims. While there was general knowledge in the art of a variety of uses for ceramic matrices, the Office Action has provided no proper motivation for substituting the resin of Damon et al. GB 2,323,056 with a partially densified solid matrix according to the present claims. First, Damon et al. alleges to

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have solved the problem using a resin. There is no suggestion in Damon et al., or the art as a whole, to carry out a partial densification step by forming a solid matrix phase within the preform. As motivation for the substitution, the Office Action has merely restated the problem to be solved; however, inventive skill is required to go from realization of that problem to the solution contained in the present claims.

Further, in the present invention the pins are implanted after consolidation of the fibrous preform by partial densification by a solid matrix material such as carbon or ceramic. This is an additional aspect which is not taught or suggested by Damon et al. GB 2,323,056. According to the present claims, the substantial remaining porosity allows the pins to be easily implanted, whereas the consolidation allows the preform not to be deformed during implantation of the pins. The densification is thereafter continued. Thus a precise perforation design can be achieved with the instant invention, which is important for some applications like for a perforated wall of a combustion chamber in a gas turbine. By contrast, such a precise design cannot be achieved with the process of Damon et al. GB 2,323,056 in which the pins are implanted in a deformable (and later deformed) panel.

-8-

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The Jarmon et al. reference is cited as evidence that at the time of the invention a person of ordinary skill in the art would have known to use oxidation to remove carbon fiber rods in a ceramic matrix composite material. This does not cure the defect of the Damon et al. GB 2,323,056 reference as discussed above. Both references, either alone or in combination, fail to teach or suggest the use of a partial densification by a solid matrix or the insertion of pins after such a partial densification step.

The cited references do not teach or suggest every limitation of the present claims, and no proper motivation for combining the references has been provided. Therefore, no *prima facie* case for obviousness has been presented. The withdrawal of this rejection is respectfully requested.

Claim 3 is rejected as allegedly obvious over Damon et al. GB 2,323,056 in view of Jarmon, and further in view of Hegedus. The rejection is respectfully traversed.

Claim 3 is directed to the method of claim 1 in which the pins have a core material that can be eliminated and a peripheral portion or sheath of ceramic that is not eliminated. Hegedus is cited for teaching that carbon fibers that were oxidized out of a thermosetting matrix material could be coated with ceramic

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Application No. 10/786,409
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precursor material. However, as described above, even if the teachings of Hegedus were applicable in the context of the present claims, due to the failure of the Damon et al. GB 2,323,056 reference, either alone or in combination with Jarmon and Hegedus, to teach or suggest the use of partial densification by a solid matrix or the insertion of pins after such a partial densification step, claim 3 is not rendered obvious. Withdrawal of the rejection is respectfully requested.

Claims 6 and 7 are rejected as allegedly obvious over Damon et al. GB 2,323,056 in view of Jarmon et al., Hegedus et al., and further in view of WO 97/06948 and Freitas et al. The rejection is respectfully traversed.

Claim 6 is directed to the method of claim 1 wherein the pins are inserted from a block of compressible material with the application of ultrasound energy. Claim 7 is directed to the method of claim 1 wherein the pins are implanted at a non-zero angle relative to a normal to a surface of the consolidated preform. WO'948 is cited as teaching the insertion of pins into a preform using an ultrasound tool. Freitas et al. is cited for teaching the insertion of pins at an angle.

-10-

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Even if the teachings of WO'948 and Freitas et al. were applicable in the context of the present claims, due to the failure of the Damon et al. GB 2,323,056 reference, either alone or on combination with Jarmon, Hegedus, WO'948, and Freitas, to teach or suggest the use of partial densification by a solid matrix or the insertion of pins after such a partial densification step, claims 6 and 7 are not rendered obvious. Withdrawal of the rejection is respectfully requested.

Rejections Under 35 U.S.C. §112, second paragraph

Claims 1-16 are rejected as allegedly indefinite for the use of several terms and phrases in claims 1, 7, 10, and 11. The rejection is respectfully traversed.

Claims 1, 7, and 11 have been amended according to the suggestions of the Examiner. Claim 10 has been canceled. Therefore, in light of the claim amendments, the rejection is moot.

-11-

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CONCLUSION

The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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